

# **Radio Frequency Interference Measurement System**

*For the  
Quarterly Review of the NASA/FAA Joint University  
Program for Air Transportation Research*

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Ohio University, Athens**

**Project Sponsor: FAA**



# **Purpose of the RFIMS**

**Determine and isolate Radio Frequency Interference (RFI) problems with the National Airspace System (NAS) communication and navigation facilities through in-flight analysis of signal data collected on an airborne platform.**



# **Radio Frequency Interference (RFI) Team Capabilities**

- **Airport Airspace Analysis Modeling**
  - **Prediction of interference levels within ILS/VOR/VHF Communication service volumes.**
- **Technical support for international frequency coordination.**
- **Airborne RF data collection**
  - **Characterization of RF environment through measurement of signal levels and noise floor.**
  - **Mitigation of ILS/VOR/VHF Comm/GPS RF interference by determining frequency, type, direction and ultimately location and cause.**



# Airborne Capabilities

**Avionic Engineering Center's  
Cessna Centurion (C210T) on a  
Radio Frequency Interference  
Mission.**



- Spectrum Analysis
- Direction Finding (DF)
- Radio Frequency Scanning

- GPS Mapping
- Signal generation & filtering
- Audio & video data recording

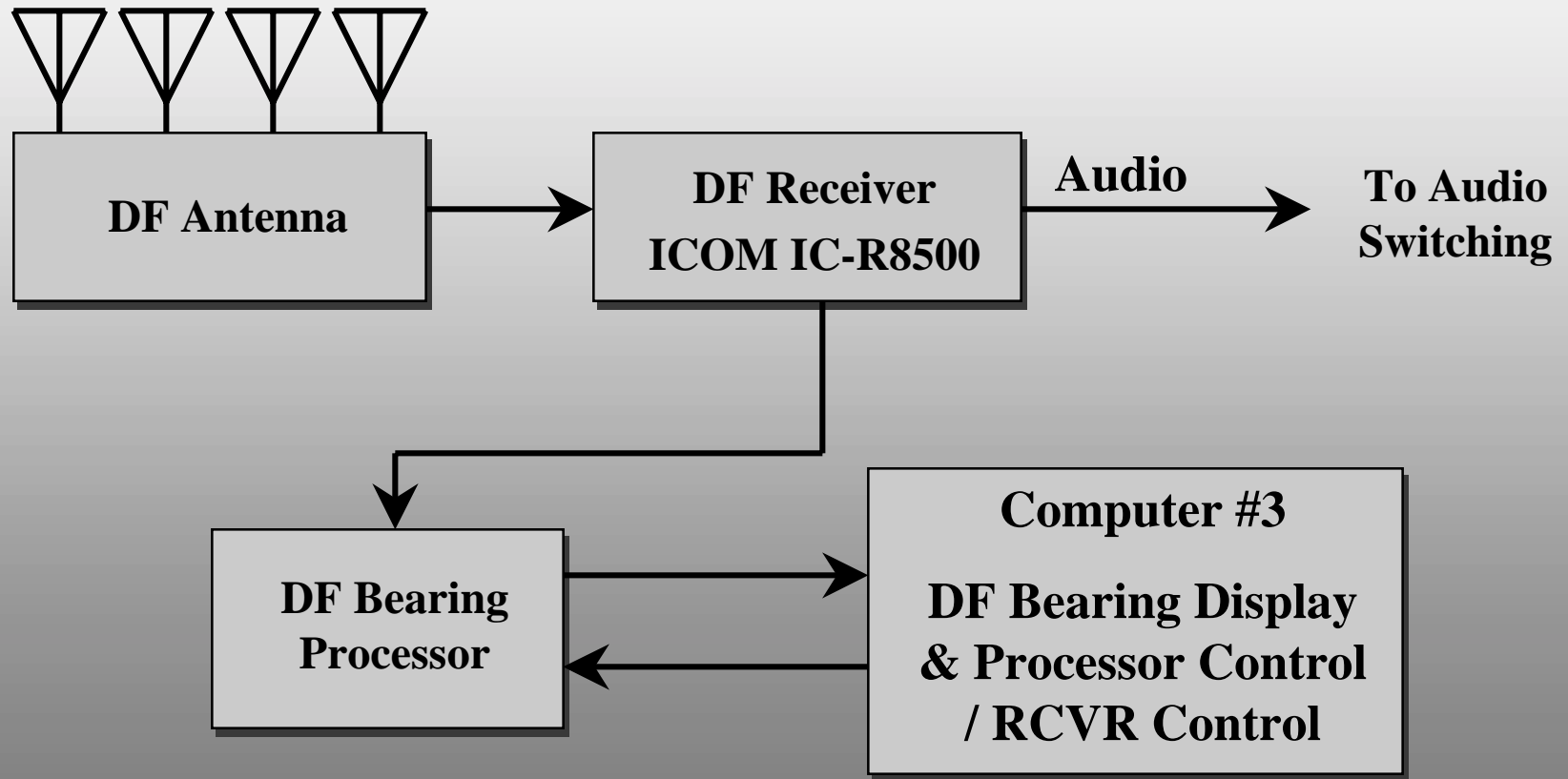


# Breakdown of Airborne Capabilities

- **Radio Direction Finding**
- **Signal Analysis and Measurement**
- **Audio Comparison & Recording**



# Radio Direction Finding



# Four-aerial Adcock Antenna



# DF Receiver

## ICOM IC-R8500 Communications Receiver



<http://www.icomamerica.com/receivers>

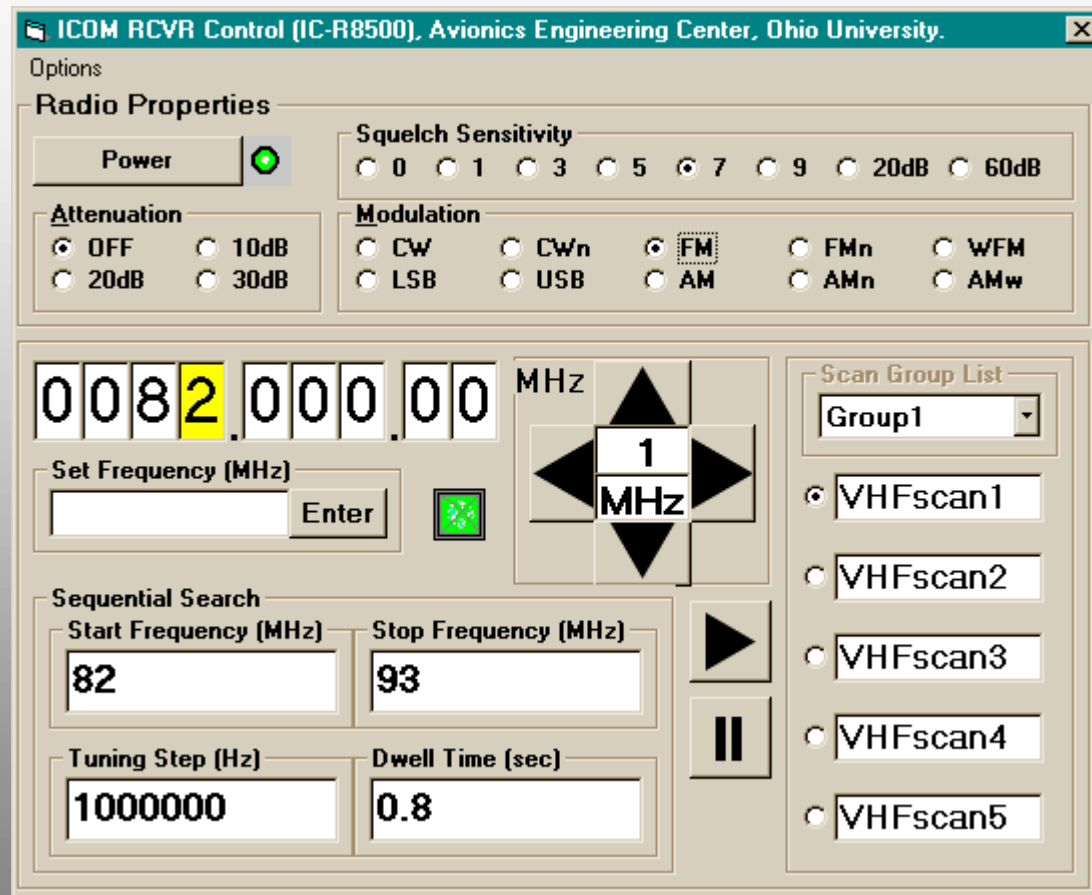
### Frequency Range:

- 0.10000 – 823.99999 MHz
- 849.00001 – 868.99999 MHz
- 894.00001 – 1999.99999 MHz





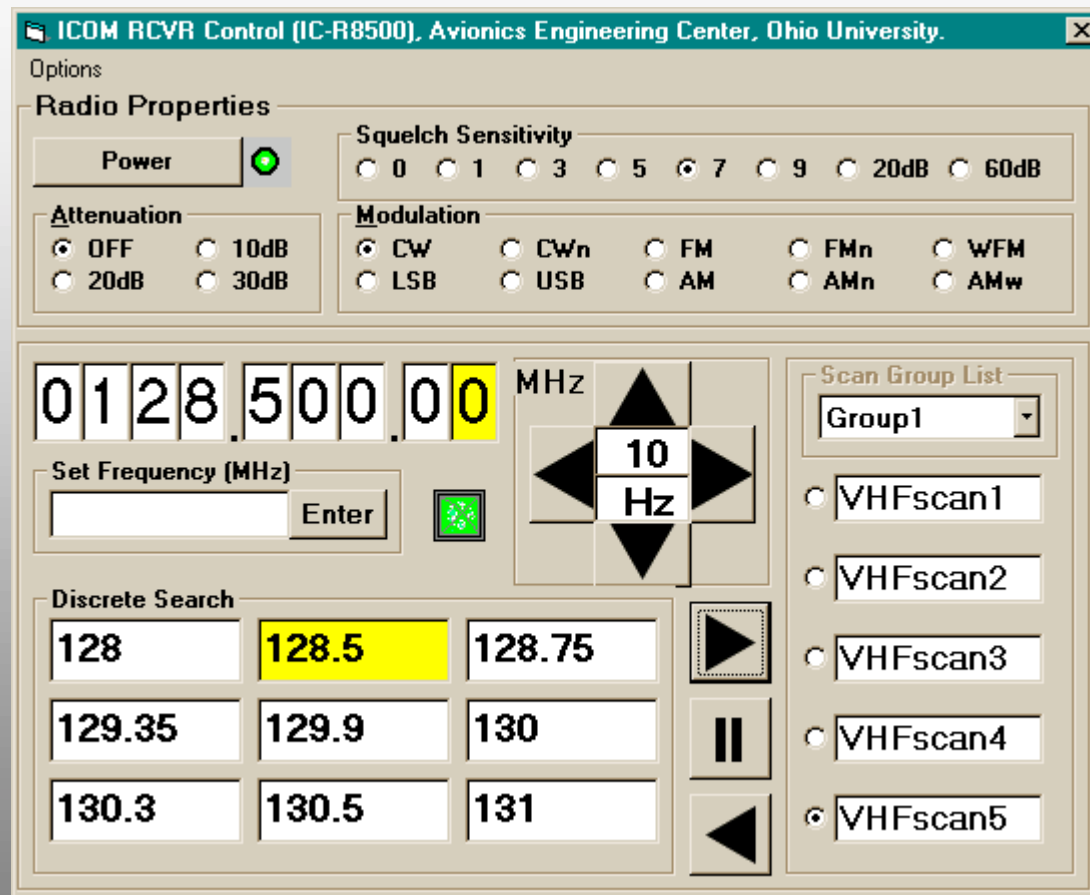
# Software Control for the Receiver



Software Receiver Control in Sequential Search Mode.



# Software Control for the Receiver



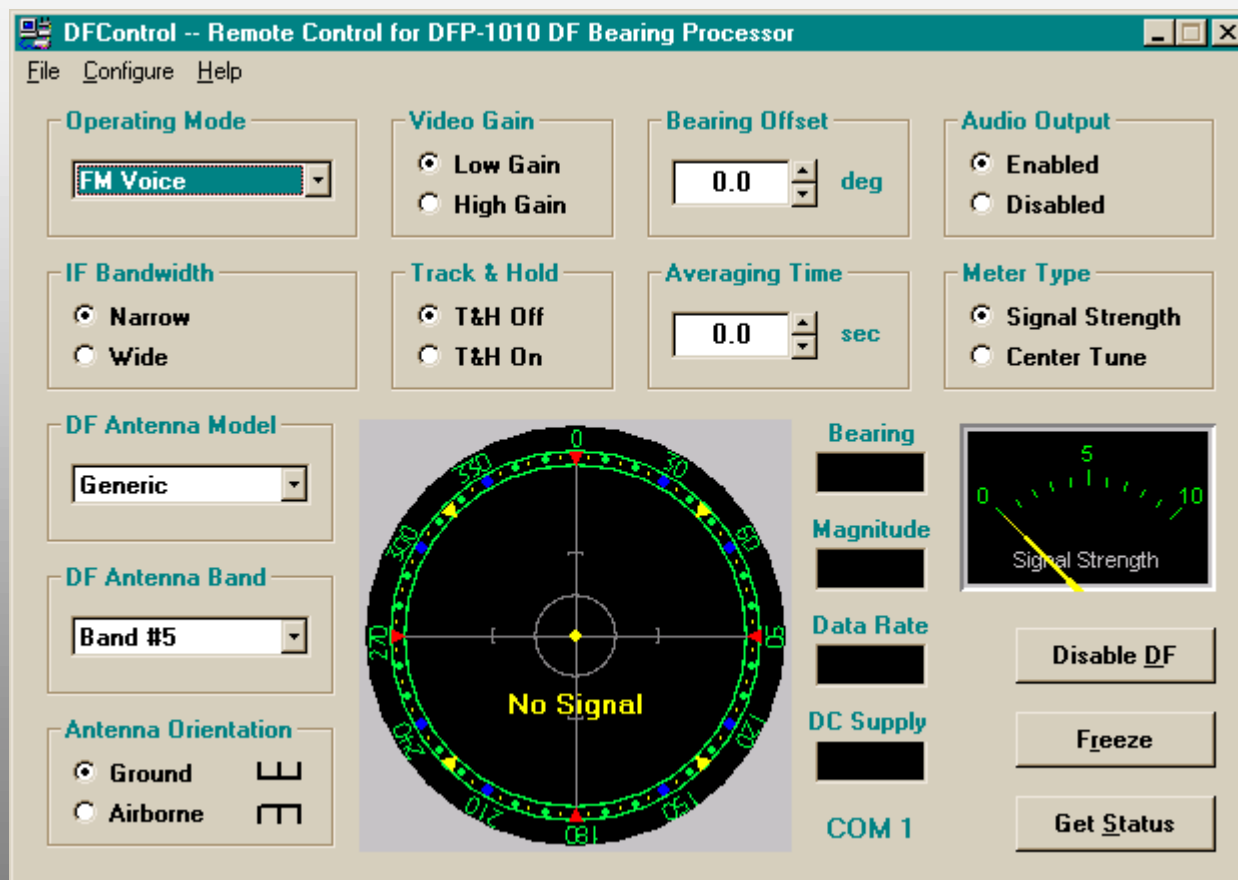
Software Receiver Control in Discrete Search Mode.



# Portable RFIMS Rack



# Software Control for DF Hardware



# RFIMS

## Signals Analysis and Measurement Components

### Rack Components

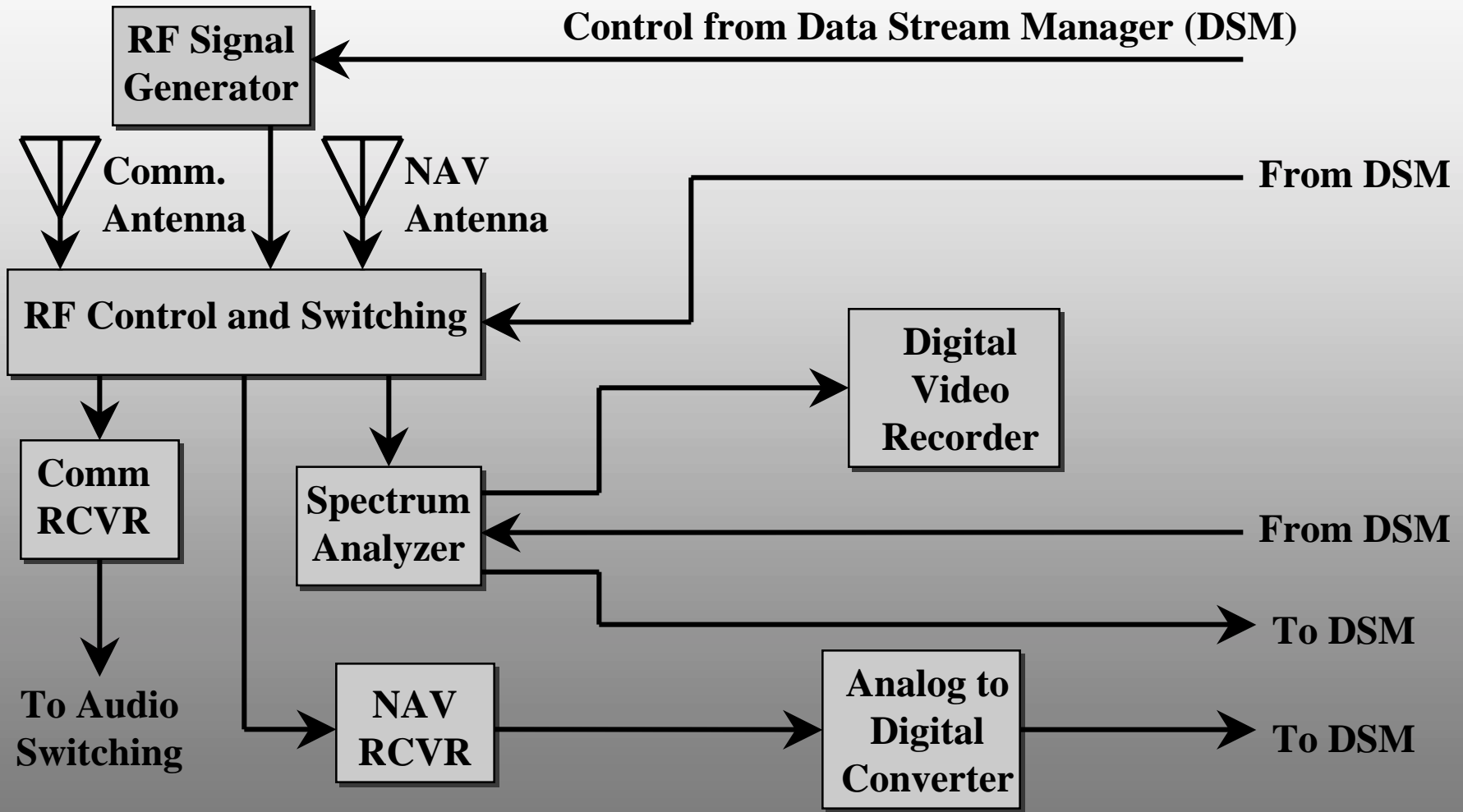
- ILS Localizer/VOR Receiver
- 2-Channel Intercom
- 16-Channel A/D Converter
- 2 Embedded Systems
- RF Control Unit

### External Components

- Spectrum Analyzer
- RF Signal Generator
- Digital Video Recorder
- Digital Altimeter
- GPS Receiver
- 2 Portable Computers



# Signal Analysis and Measurement



# Spec A / Sig Gen / Receiver



# Control for the Spectrum Analyzer

SAControl: 1.0.19 - Avionics Engineering Center, Ohio University / (Not Recording)

**Center Frequency**  
105.5 Specify Freqs  
☐ MHz ☒ GHz ☒ Multi-freq

**Trace**  
Collection Mode  
☐ Manual ☒ Interval ☐ Streaming  
Interval (sec) 0 00.0 Get Trace

**DataLink Monitor**  
Settings read from file  
Initializing...  
SETDATE 010401;  
SETTIME 161300;  
IP:TS;  
TITLE %OU Avionics  
Engineering Center%;  
RL -10DM;  
Current Settings sent to SA  
CF 105.5 GHz;  
SP 1000.0 Hz;  
RB 10.0 KHz;  
VAVG OFF;  
Initialization complete  
LatLon:  
Clear Monitor Start Log

**Trace Mode**  
Number of Averages  
☒ 2 ☐ 5 ☐ 10 ☐ 20 ☐ 50  
☒ Live ☐ Avg

**Peak**  
Window Size (divisions)  
☐ 0.2 ☐ 0.5 ☒ 1 ☐ 2 ☐ 5 ☐ 10  
Collection Mode  
☐ Manual ☒ Interval ☐ Streaming  
Interval (sec) 0 00.0 Get Peak

**Frequency Span**  
1000.0 ☐ Hz ☒ KHz  
☐ MHz

**Resolution Bandwidth**  
10.0 ☐ Hz ☒ KHz  
☐ MHz

**Custom SA Command**  
☐ Response Expected  
Collection Mode  
☐ Manual ☒ Interval ☐ Streaming  
Interval (sec) 0 00.0 Send Cmd

**Settings File**  
☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5 ☐ 6

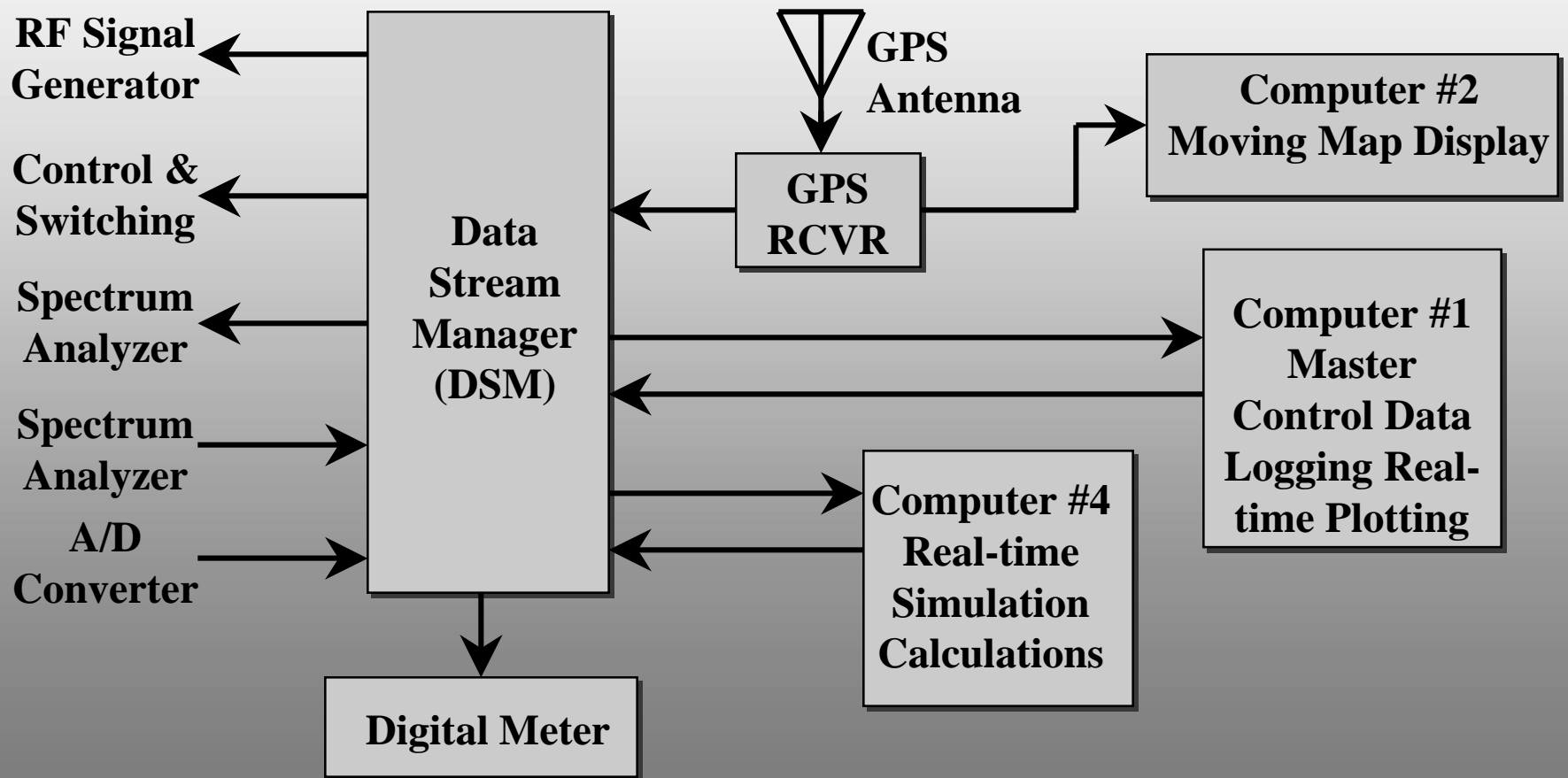
**Log File Annotation**  
Write to File

Send Current Settings to SA  
Save Current Settings to File  
Read Current Settings from SA  
Restore Settings from File





# Signal Analysis and Measurement Computer Control



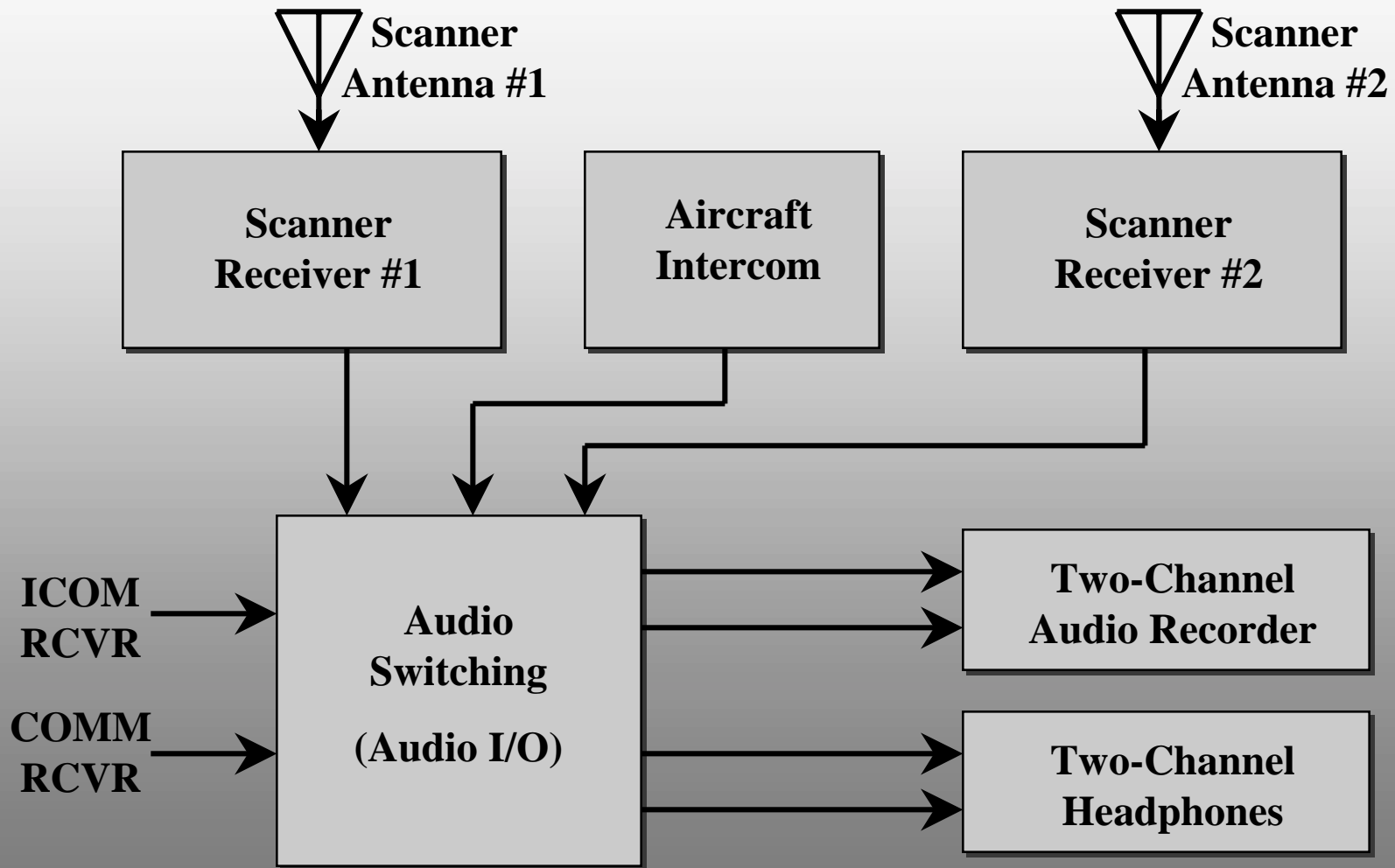
# Moving Map Display



# RFIMS Position



# Audio Comparison & Recording



# Airborne Missions

## Signal Analysis and Measurement Missions:

- Simulate Signals to determine if they are a possible RFI threat to NAS communication facilities
- Measure localizer signal to insure they are in proper working order.
- Fly grid patterns to determine antenna coverage of the VOR.

## Direction Finding Missions:

- Determine and locate RF interference.



# Airborne DF Statistics

## Direction Finding Missions:

- 100 % success rate for RF interference missions.
- 50% resolved by Direction finding.
- 50% resolved using Audio Comparison.



# Contact Information

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